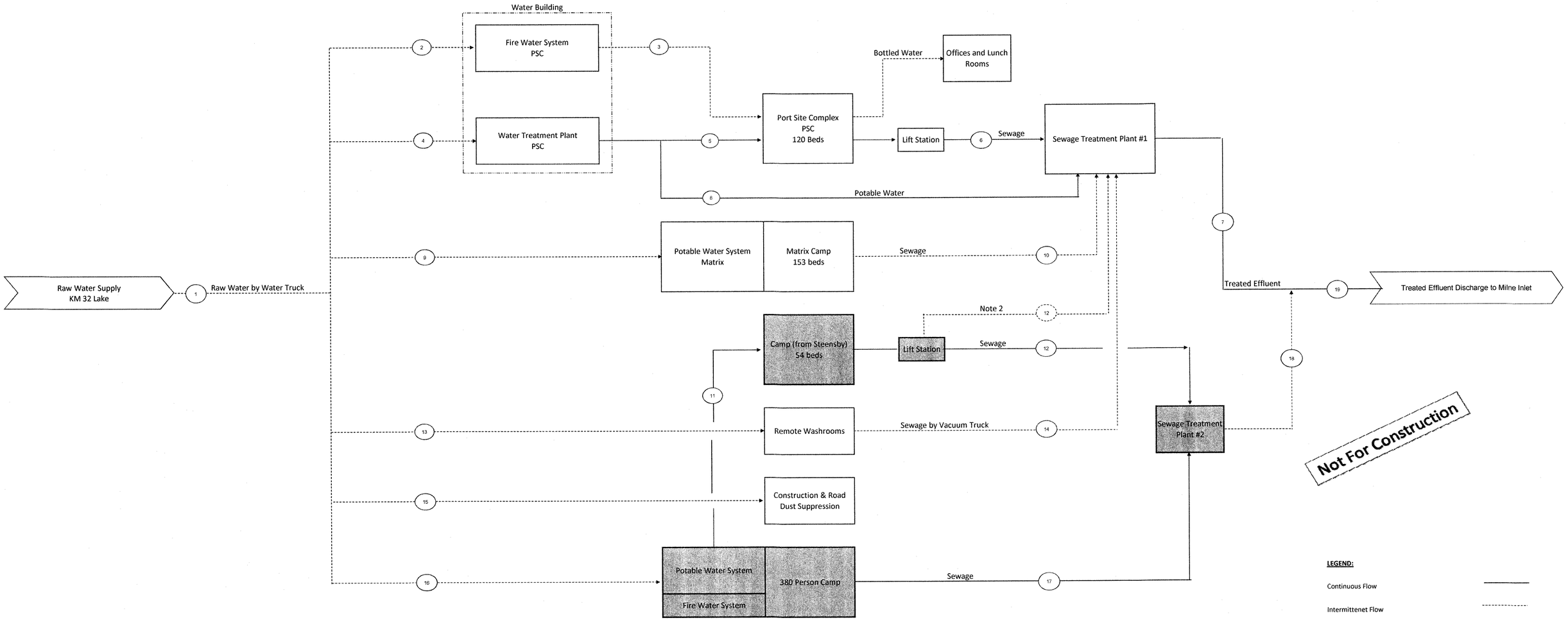
Attachment 6

Milne Port Water Management Process Flow Diagram



Stream No.	1	2	3	4	5	6	7	8	9	10
Stream Description	RAW WATER FROM KM32 LAKE	RAW WATER TO FIRE TANKS	FIRE WATER TO PSC	RAW WATER TO PSC	POTABLE WATER TO PSC	SEWAGE FROM PSC	TREATED EFFLUENT FROM STP #1	POTABLE WATER TO STP	RAW WATER TO MATRIX	SEWAGE FROM MATRIX
Fluid	RAW WATER	RAW WATER	RAW WATER	RAW WATER	POTABLE WATER	SEWAGE	TREATED EFFLUENT	POTABLE WATER	RAW WATER	SEWAGE
Units	m^3/day	m^3/day	m^3/hour	m^3/day	m^3/day	m^3/day	m^3/day	m^3/hour	m^3/day	m^3/day
Current Permit Limit	367.5	-	-	-	-	-	-	-	-	-
Calculated Flow	192	One off fill	113	30	24	24	58	6	31	31
Stream No.	11	12	13	14	15	16	17	18	19	20
Stream Description	POTABLE WATER TO NEW CAMP	SEWAGE FROM NEW CAMP	RAW WATER TO WASHRMS	SEWAGE FROM WASHRMS	CONST. & ROAD DUST	RAW WATER TO 380 PERSON CAMP	SEWAGE FROM 380 PERSON CAMP	TREATED EFF. FROM STP #2	TREATED EFFLUENT TO ENVIRONMENT	
Fluid	POTABLE WATER	SEWAGE	RAW WATER	SEWAGE	RAW WATER	RAW WATER	SEWAGE	TREATED EFFLUENT	TREATED EFFLUENT	
Units	m^3/day	m^3/day	m^3/day	m^3/day	m^3/day	m^3/day	m^3/day	m^3/day	m^3/day	
Current Permit Limit	-	-	-	-	Note 1	-	-	-	-	
Calculated Flow	11	11	3	3	20	109	95	136	194	

Notes:

1. Included in Stream # 1
2. Stream No. 12 flows will be directed to Sewage Treatment Plant #1 by Sewage Vacuum Truck until Sewage Treatment Plant #2 becomes online

REGISTERED PROFESSIONAL ENGINEER
M. J. BUYKX
LICENSEE
19/7/17
NTNU

REV	ISSUE FOR	AUTH. BY		DATE
2	PERMITTING	JH	MB	19/7/2017
1	PERMITTING	TB	MB	13/7/2017
0	PERMITTING	TB	MB	26/6/2017
	ISSUE AUTHORIZATION			

HATCH

Baffinland

DESIGNED BY T. BRUCE DATE:	DRAWN BY T. BRUCE DATE:
CHECKED BY M. BUYKX DATE.	DISCIP ENGR. DATE:
PROJ. DES. COORD. DATE:	PROJ. ENGR. N. MASON DATE:
PROJ. MGR S. HEINER DATE.	

BAFFINLAND IRON MINES LP
MARY RIVER PROJECT

MILNE PORT
WATER AND SEWAGE
PROCESS FLOW DIAGRAM

SCALE NTS OR AS NOTED | DWG NO. H353004-40000-221-282-0001 | REV. 2

Attachment 7

Potable Water Treatment Plant Performance Guarantee

newterra
clean water. modular solutions. simple.

1291 California Avenue, P.O. Box 1517
Brockville, ON, K6V 5Y6
T: 800.420.4056 F: 289.203.1319

Baffinland Iron Mines Corporation

newterra Project #:1704653
Project Name: Baffinland - Mary River Project 430 Man WTP
C/O
Horizon North Camps and Catering
5637-67 Avenue NW
Edmonton Alberta

newterra guarantees that when the supplied water treatment system is operated during a performance test in accordance with the designed conditions, the facility will be capable of producing the designed water quality at the designed flowrate. The plant shall be operated within the design conditions listed in the tables below, and must be operated in accordance with newterra operations manual.

The system shall process 100% of the design flow listed when that flow consists of water with constituent concentrations equal to or lower than those listed in the Baffinland Hatch Raw water Properties of Camp Lake and km 32 Lake document H353004-00000-120-078-001 rev 0 received by newterra Ltd.

Table 1

Influent Flow Rate	Design Value	Metric Unit
Average Daily Flow (ADF)	99.25	m^3/d

Jeff Kempson P.Eng

T: 800.420.4056 x 1245| C: 613.802.4205 | F: 613.345.7633
1291 California Ave., PO Box 1517
Brockville, ON K6V 5Y6
jkempson@newterra.com | www.newterra.com

REGISTERED PROFESSIONAL ENGINEER
J. KEMPSON
LICENSEE
NT/NU

newterra BEST MANAGED COMPANIES

Attachment 8

Waste Water Treatment Plant Performance Guarantee

BANNER
environmental engineering consultants ltd.

August 4th, 2017

Mr. Justin MacPherson
Operations Supervisor Water Resources
Horizon North Logistics Inc. – Camps and Catering
1802 - 8 St
Nisku, AB T9E7W2
(780) 955-2992

Dear Mr. MacPherson,

Banner Environmental Engineering Consultants Ltd. (Banner) has been retained by Horizon North Camps and Catering (HNCC) to perform a 3rd-party design review of the Baffin Wastewater Treatment Plant (WWTP) constructed in 2011 by Filterboxx Water & Environmental Corporation (Filterboxx). Banner has over 25 years in collective experience in designing, constructing, commissioning and operating water and wastewater treatment plants all over Western Canada, as well as the arctic.

The Baffin camp shall have the following expected operating parameters:

Maximum Camp Population:	400-persons
Consumption per Capita:	225 L/person-day
Maximum Volume to be Treated:	90 m^3/day
Biochemical Oxygen Demand:	300 mg/L
Total Suspended Solids:	500 mg/L

The required effluent treatment parameters are as follow:

Biochemical Oxygen Demand:	100 mg/L
Total Suspended Solids:	120 mg/L
Oil and Grease:	No Visible Sheen
pH:	6.0 – 9.5
Toxicity:	Not acutely toxic

HNCC has provided Banner a WWTP design using GE's Zeeweed membrane bioreactor. The Baffin WWTP was previously in operation in HNCC's Black Sands camp located in Fort McMurray, AB. Banner has had experience commissioning and operating plants based on GE's Zeeweed membrane bioreactor technology. And upon completion of our review, Banner has determined that the provided design by HNCC for operation of the Baffin WWTP is suitable and should meet and exceed the requirements for treatment of wastewater effluent.

To initiate the 3rd-party design review, HNCC has provided Banner with the following information in-regards to the WWTP:

- Piping and Instrumentation Diagrams
- General Arrangement Drawings
- Control Narrative
- Operation Manual
- Historical Operation

Shown in this review are Banner's comments in-regards to the design of the plant.

Piping and Instrumentation Diagram

Capacity and Operability

- The provided design indicates that the membranes are able to treat a total 130 m^3/day at 100% redundancy, and 260 m^3/day at 0% redundancy.
- Piping size and materials is typical for the required application, and meet the required pressure and flow requirements of the system.
- Single blower provided for each aeration tank. It is recommended that the blowers are provided with 100% redundancy, but not a requirement for effective operation. It is noted that HNCC operations group ensures back-up blowers are always kept in stock on site due to the remote location to provide the additional redundancy recommended.
- Single blower provided for each membrane for scouring. It is recommended that the blowers are provided with 100% redundancy, but not a requirement for effective operation. It is noted that HNCC operations group ensures back-up blowers are always kept in stock on site due to the remote location to provide the additional redundancy recommended.
- Design provides sufficient process gauges and instrumentation for optimal operation of the system.
- Valving used are typical for the required application.
- Single effluent pump provided with level alarm reporting. It is recommended that all pumps are provided with 100% redundancy, but not a requirement for effective operation. It is noted that HNCC operations group ensures back-up pumps are always kept in stock on site due to the remote location to provide the additional redundancy recommended.
- Adequate level alarms are provided.

Treatment

- Equalization and pre-treatment provided
- Based on the provided required flows, up to a 30-hour hydraulic residence time is provided on the aeration tanks, using both aeration tanks. Actual hydraulic residence time must be controlled by the plant operator. Aeration treatment is considered sufficient to meet the necessary effluent parameters.
- Process redundancy recommended, but not required for treatment tanks. Membrane bioreactors can operate at 100% redundancy, based on the design volumes produced by the camp.
- Aerobic sludge digestion is provided.
- Nominal operating flux rates for the ZeWeed membrane bioreactors are met based on the design.
- UV Disinfection provided for membrane permeate.

Mailing Address:
PO Box 40026 Southridge RPO
Okotoks, AB T1S 2G2

Courier Address:
Unit 217, 220 - 3rd Street, NE
Black Diamond, AB T0L 0H0

Phone: (403) 933-4199
Fax: (403) 933-4177
Website: www.banneree.com

General Arrangement Drawings

- WWTP to be provided in sea containers for housing. Foundation details of the housing are not provided.
- General arrangement of the plant is separated into equalization/pre-treatment, membrane bioreactor, and a mechanical container skid (blower housing). No immediate deficiencies in terms of access and spacing are required to be corrected at this time.
- HVAC and HVAC controls to be tested before putting into service. Insulation must be checked for any damages prior to operation.

Control Narrative

- Control narrative provided is typical for the operation of membrane bioreactor WWTPs.
- Alarming provided is sufficient and typical of operation.

Operation Manual

- Sufficient information provided for the operation along with typical operating parameters.
- Operation health and safety requirements are provided, including MSDS.
- Maintenance schedule provided, but is general and sufficient for operation.
- Vendor/supplier list of equipment and motors to be kept with operations manual.
- Remote log-in to the camp has been provided.

Historical Operation

- The plant was operated historically on HNCC's Black Sands Camp
- No historical contraventions to the previous operational approval of the WWTP
- Last testing performed showed effluent BOD results of <2.0 mg/L and TSS results of <3.0 mg/L
- Since the plant has not been in operation for some time, Banner recommends that structural integrity of piping and tanks be checked prior to operation. In addition, all mechanical and electrical equipment be checked prior to operation.

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Website: www.banneree.com

Conclusions

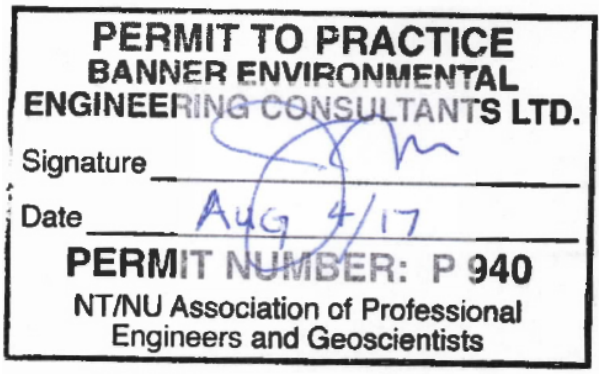
Based on the provided data and Banner's previous history of operating and commissioning GE Zeeweed Membrane Bioreactors, Banner can confidently confirm that the Baffin WWTP is suitable for operation in HNCC's Baffin camp. In addition, Banner can also confidently confirm that the provided design for the Baffin WWTP should meet and exceed the required effluent discharge requirements for the plant.

If you require any additional questions, please do not hesitate to contact us at (403) 933-4199.

Sincerely,

James Marr, M. Sc., P. Eng.
President and Chief Engineer
Banner Environmental Engineering Consultants Ltd.

CC: Joseph P. Manacsa



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Black Diamond, AB T0L 0H0

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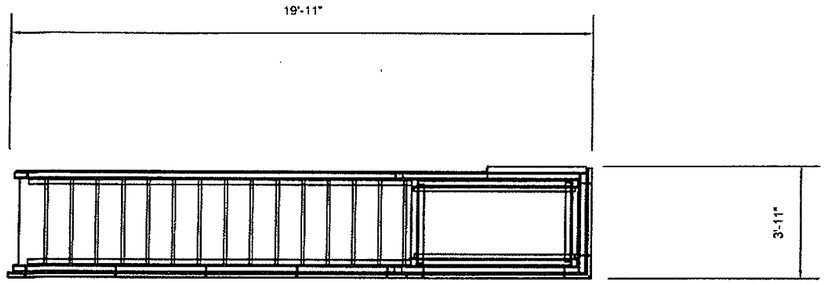
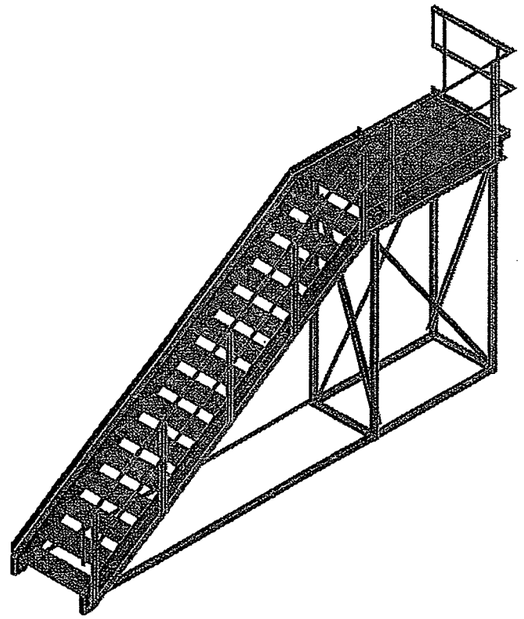
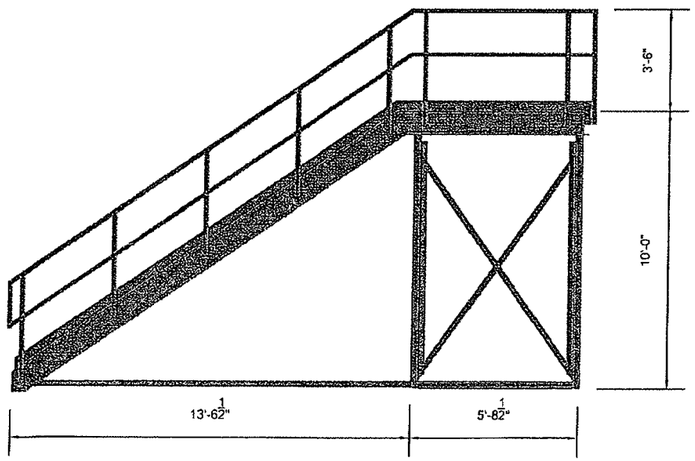
Attachment 9

Waste Water Treatment Plant General Arrangement



PLAN VIEW





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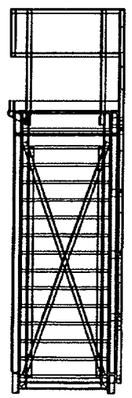

FRONT

NOTES

REFERENCE DRAWINGS

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TITLE
STAIRS
HORIZON NORTH
TYPICAL GENERAL ARRANGEMENT

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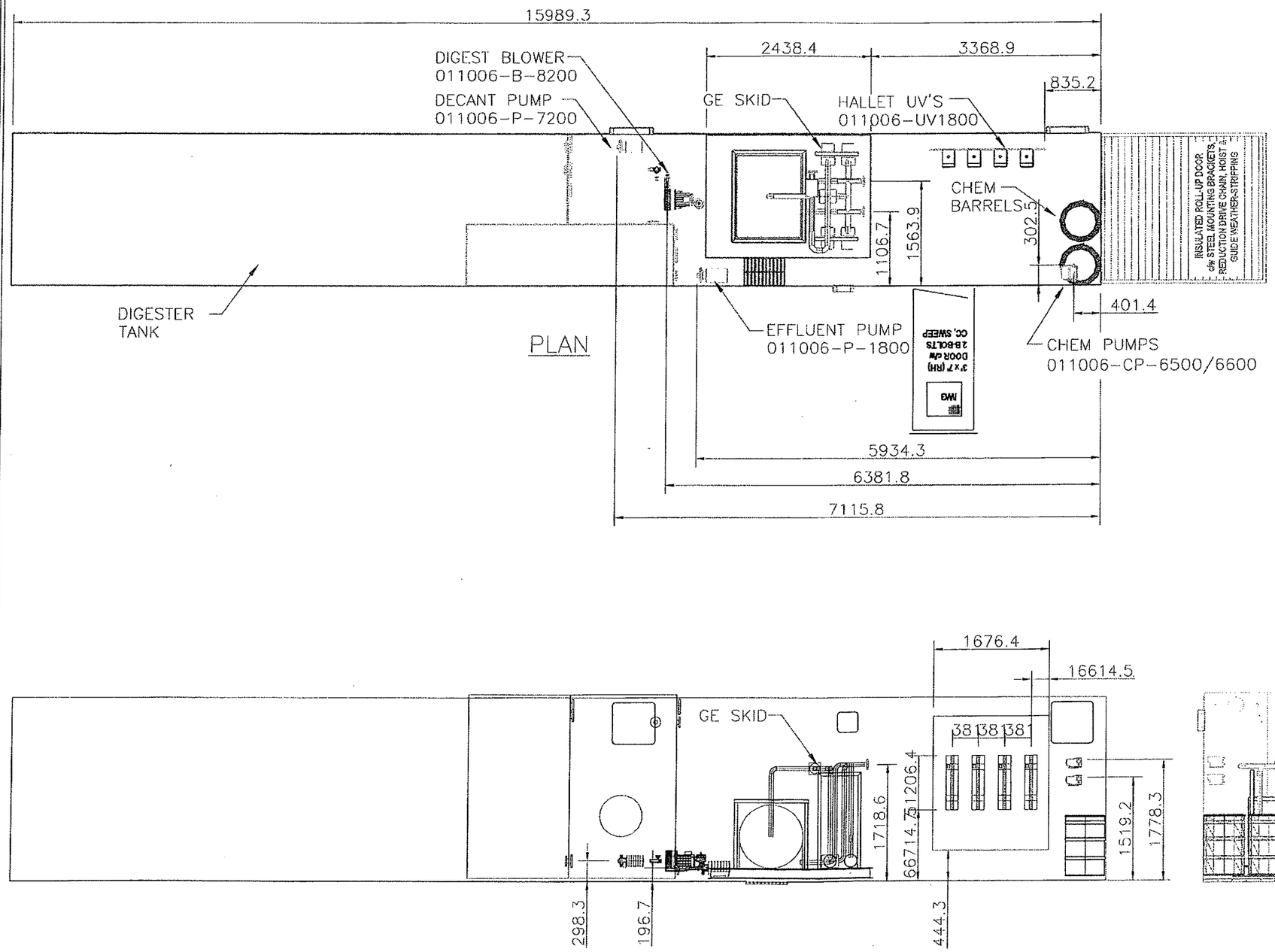
SHEET 1 OF	DRAWING NO. 011006-LAY-011	REV. 0



NOTES

REFERENCE DRAWINGS

REV.	DATE	DESCRIPTION	BY	CHK.	ENG.	APP.

FilterBoxx

TITLE

GERERAL ARRANGEMENT
HORIZON NORTH
DIGESTER CONTAINER GA

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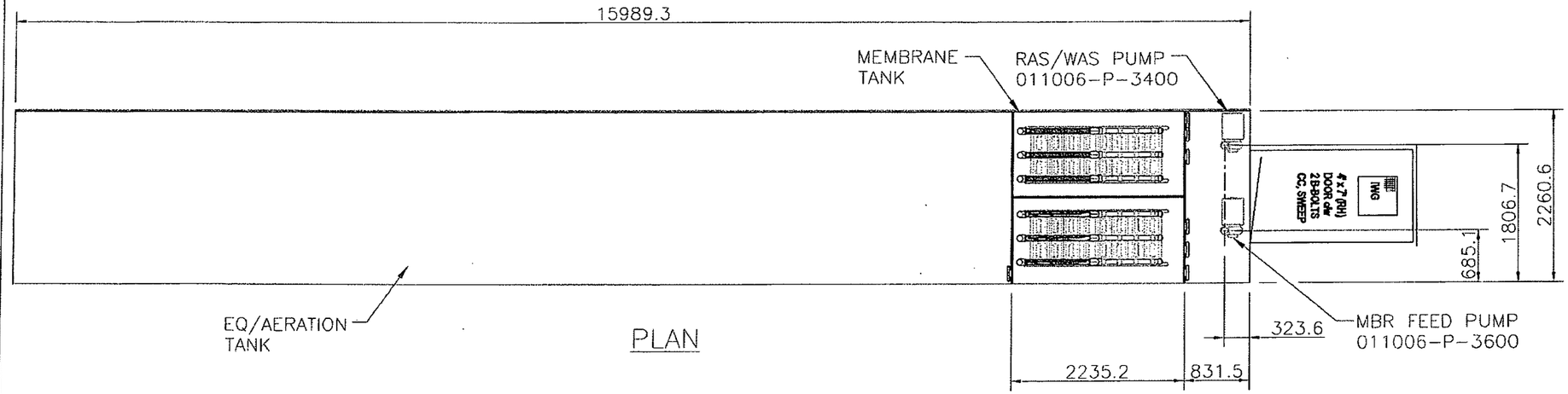

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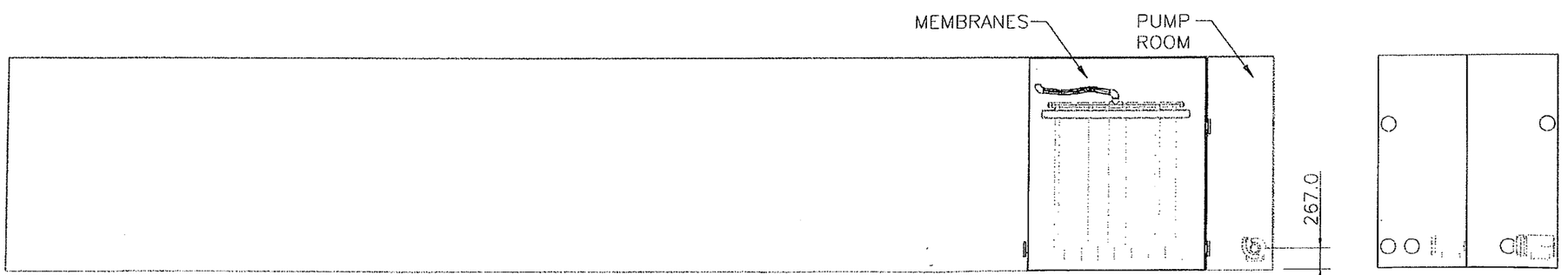

ELEVATION

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NOTES

REFERENCE DRAWINGS

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TITLE
GERERAL ARRANGEMENT
HORIZON NORTH
EQ/AERATION CONTAINER GA

PLANT AREA

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PH		
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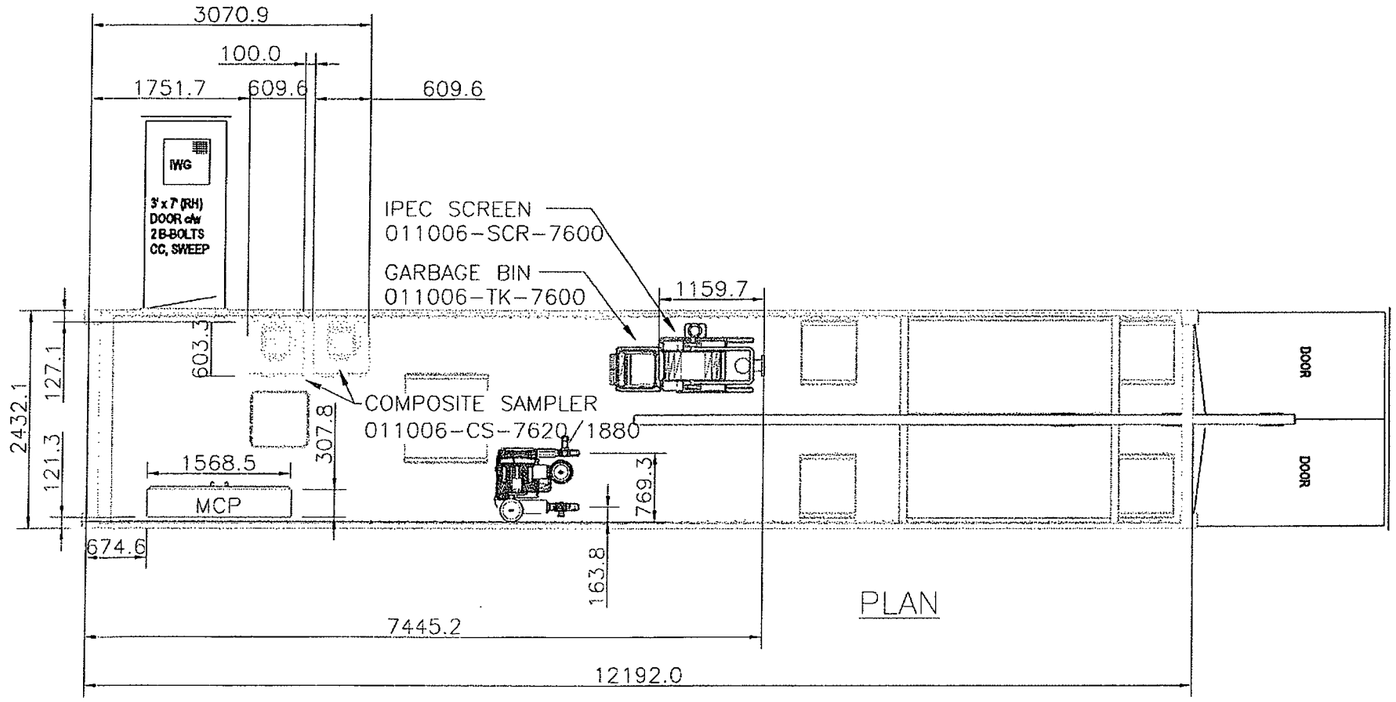

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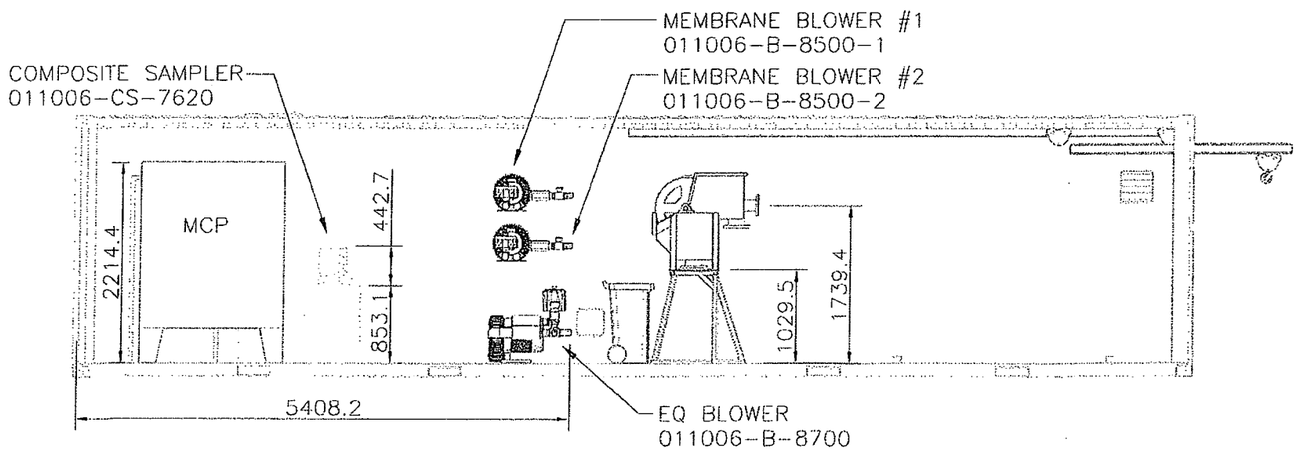

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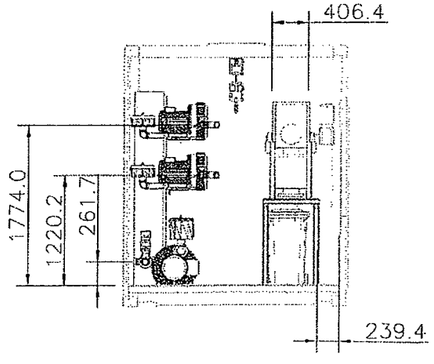

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GERERAL ARRANGEMENT
HORIZON NORTH
MECHANICAL CONTAINER GA

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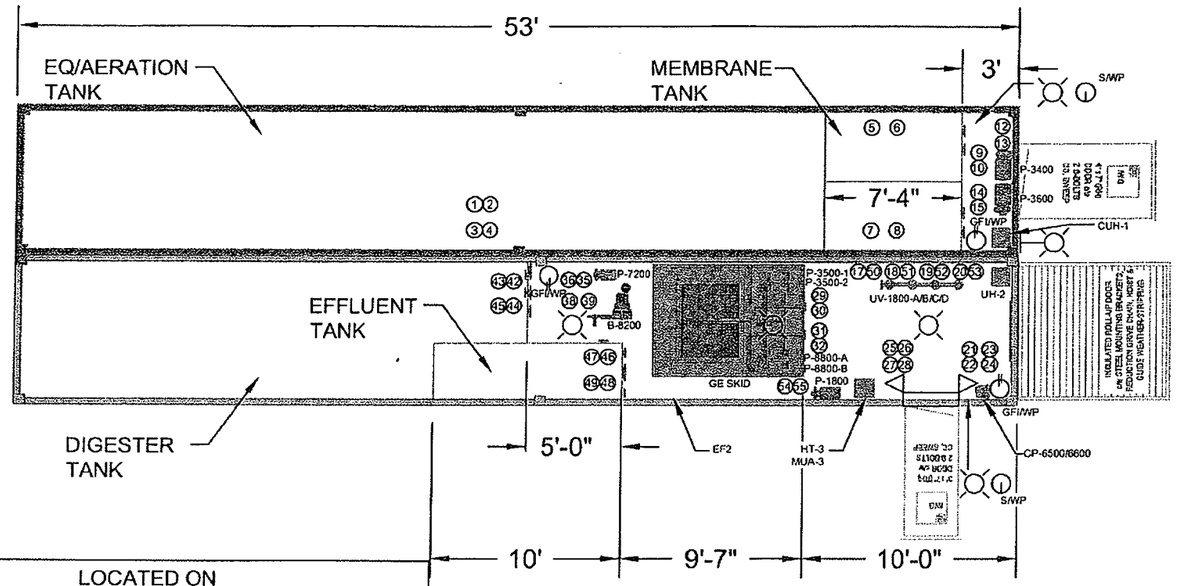

LOCATED ON GE SKID			
(56) PE-3523-1	(64) LSH-8802	(72) DI-3500-1	(80) DO-3561-1
(57) PIT-3523-1	(65) LSL-8803	(73) DO-3500-1	(81) DO-3561-2
(58) PE-3523-2	(66) FV-3560	(74) DI-3500-2	
(59) PIT-3523-2	(67) DO-3560	(75) DO-3500-2	
(60) AI-3523-1	(68) FIT-3520	(76) DI-8800-A	
(61) AI-3523-2	(69) AI-3520	(77) DO-8800-A	
(62) DI-8802	(70) FV-3561-1	(78) DI-8800-B	
(63) DI-8803	(71) FV-3561-2	(79) DO-8800-B	

(1) LT-3626	(29) FV-1860	(42) LSHH-7201	
(2) AI-3626	(30) DO-1860	(43) DI-7201	
(3) LSHH-3601	(31) FIT-1880	(44) LT-7226	
(4) DI-3601	(32) AI-1880	(45) AI-7226	
(5) LSLL-3404-1		(46) LSHH-1801	
(6) DI-3404-1		(47) DI-1801	
(7) LSLL-3404-2	(35) DI-7200	(48) LT-1826	
(8) DI-3404-2	(36) DO-7200	(49) AI-1826	
(9) DO-3400		(50) DO-1800A	
(10) DI-3400	(38) DI-8200	(51) DO-1800B	
	(39) DO-8200	(52) DO-1800C	
(12) DO-3461		(53) DO-1800D	
(13) FV-3461		(54) DO-1800	
(14) DI-3600		(55) DI-1800	
(15) DO-3600			
(17) DI-1800A			
(18) DI-1800B			
(19) DI-1800C			
(20) DI-1800D			
(21) DI-6500			
(22) DO-6500			
(23) DI-6600			
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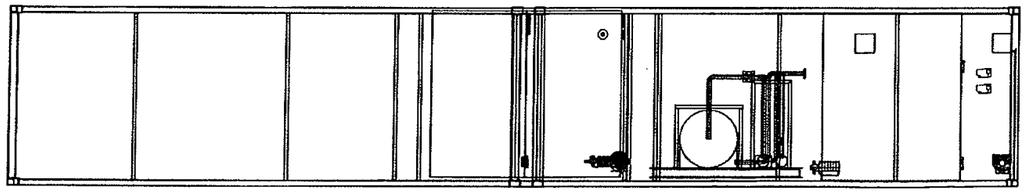
ELEVATION



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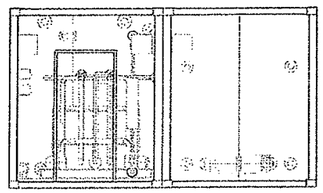

NOTES

- WALL PACK (W70SPL120M6/LITHONIA)
- FLOURESCENT FIXTURE
- EXIT/COMBO (3LER3000/LUMACELL)
- GFI - GROUND FAULT PROTECTED RECEPTACLE
- WP - WEATHER PROOF COVER & ENCLOSURE
- (1)S - 1 POLE SWITCH

REFERENCE DRAWINGS

REV.	DATE Y	M	D	DESCRIPTION	BY	CHK.	ENG.	APP.
0	10	07	27	ISSUED FOR INFO				

TITLE
ELECTRICAL LAYOUT
600 PERSON C-SERIES
TYPICAL GENERAL ARRANGEMENT

PLANT AREA

SCALE NTS		
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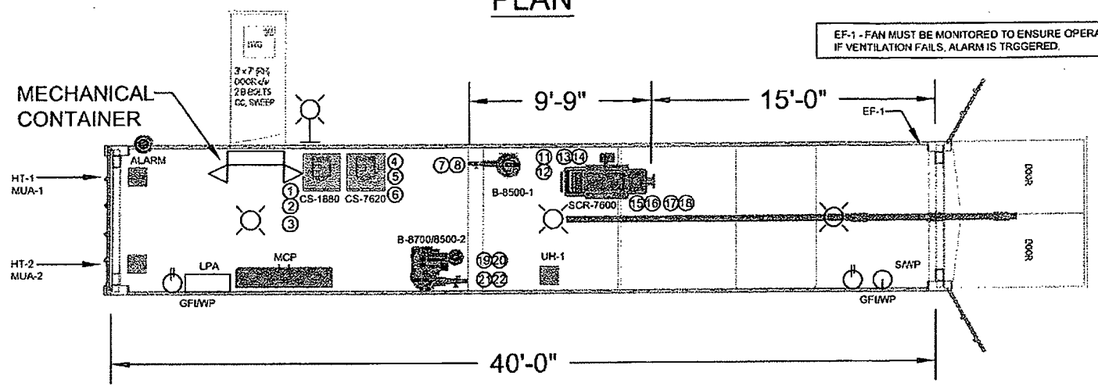
SHEET 1 OF	DRAWING NO. 011006-LAY-007	REV. 0

PLAN



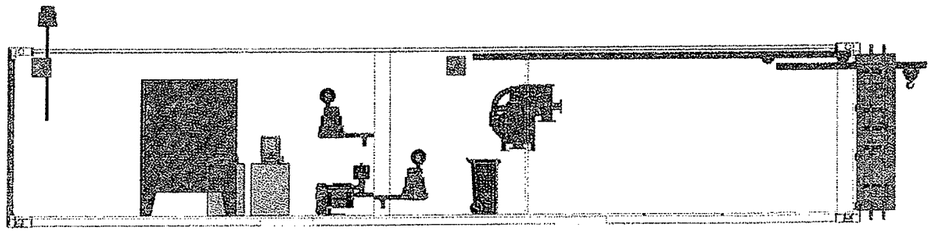
EF-1 - FAN MUST BE MONITORED TO ENSURE OPERATION. IF VENTILATION FAILS, ALARM IS TRGGERED.

1. FV-1826
2. DO-1826
3. DO-1880
4. FV-7626
5. DO-7626
6. DO-7620
7. DO-8500-1
8. DI-8500-1
11. FIT-7620
12. AI-7620
13. FV-7660
14. DO-7660
15. DO-7600
16. DI-7600
17. LSHH-7602
18. DI-7602
19. DO-8500-2
20. DI-8500-2
21. DO-8700
22. DI-8700

NOTES

- WALL PACK (W70SPL120M6/LITHONIA)
- FLOURESCENT FIXTURE
- EXIT/COMBO (3LER3000/LUMACELL)
- GFI - GROUND FAULT PROTECTED RECEPTACLE
- WP - WEATHER PROOF COVER & ENCLOSURE
- S - 1 POLE SWITCH

REFERENCE DRAWINGS



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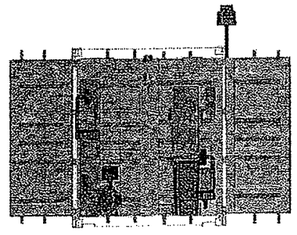

SIDE

REV.	DATE	DESCRIPTION	BY	CHK.	ENG.	APP.
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TITLE
ELECTRICAL LAYOUT
600 PERSON C-SERIES
TYPICAL GENERAL ARRANGEMENT

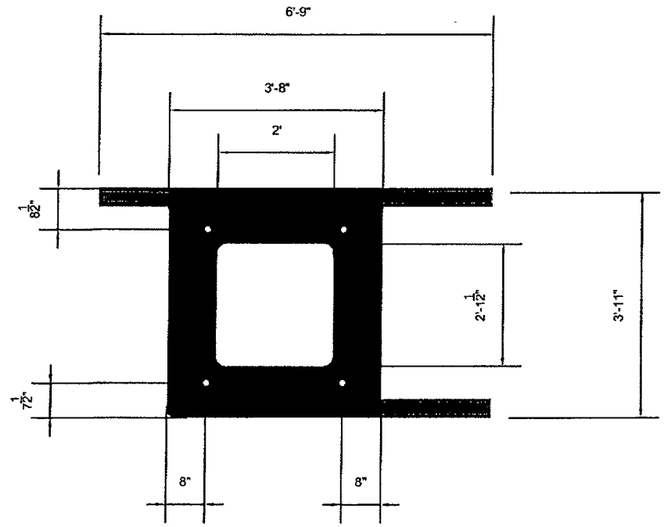
PLANT AREA

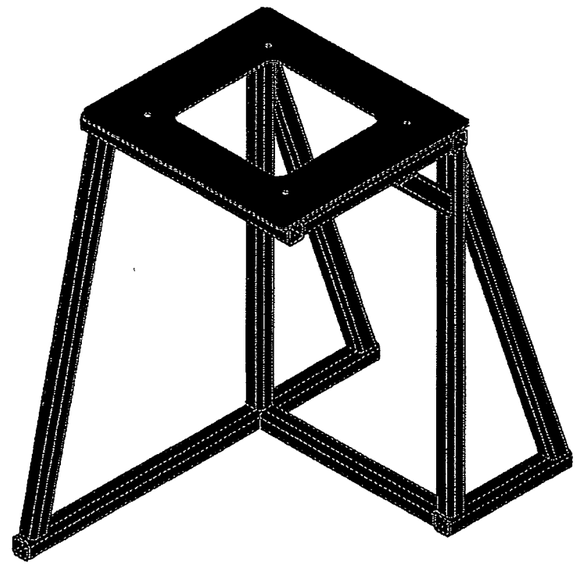
SCALE		
NTS		
DRAWN BY	CHECKED BY	APPROVED
PSH		
SHEET	DRAWING NO.	REV.
1 OF	011006-LAY-006	0

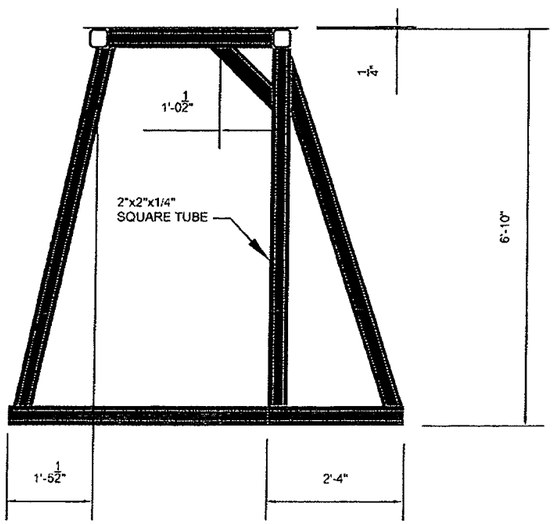
SHT

DRAWING NO.

PLAN VIEW







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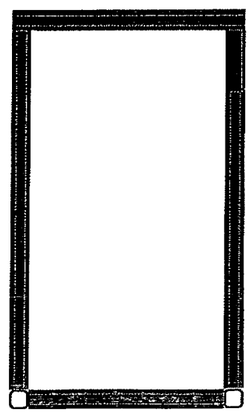


FRONT

NOTES

REFERENCE DRAWINGS

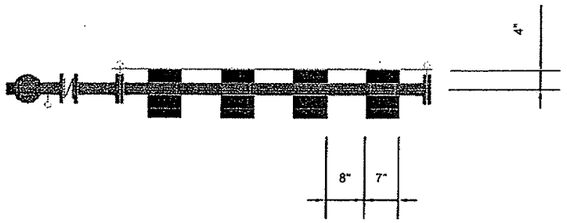
REV.	DATE (Y M D)	DESCRIPTION	BY	CHK.	ENG.	APP.

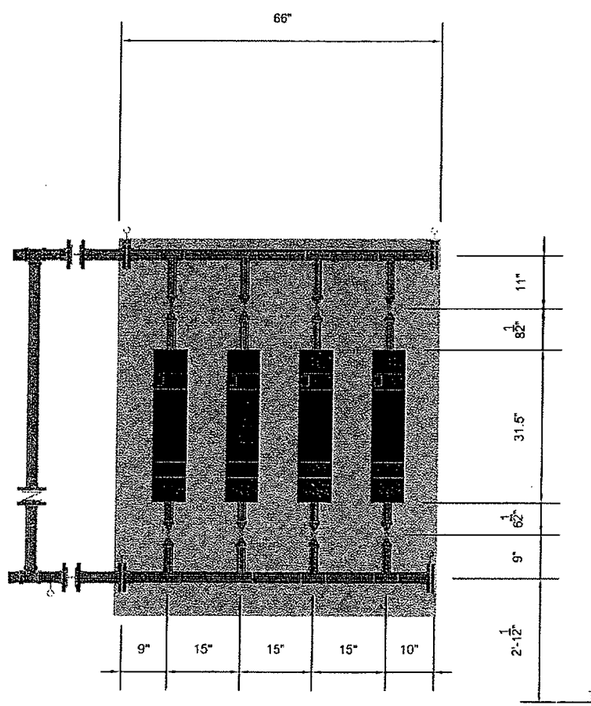
TITLE

IPEC STAND
600 PERSON C-SERIES
TYPICAL GENERAL ARRANGEMENT

PLANT AREA		
SCALE NTS		
DRAWN BY PSH	CHECKED BY	APPROVED
SHEET 1 OF	DRAWING NO. 011006-LAY-005	REV. 0

PLAN VIEW





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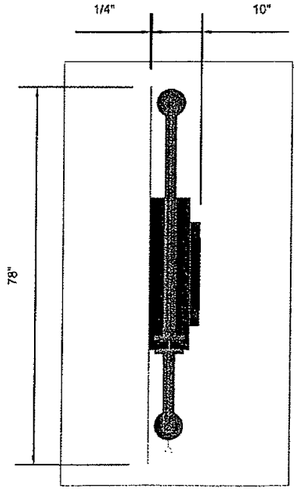

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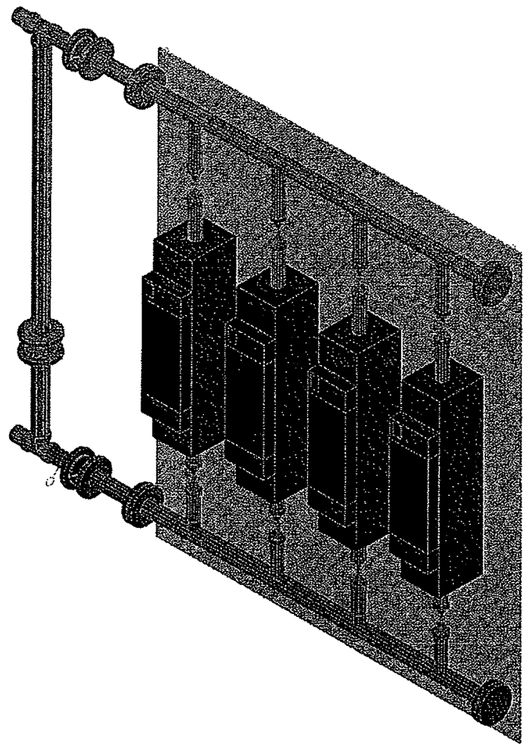

NOTES

REFERENCE DRAWINGS

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TITLE
UV SYSTEM
600 PERSON C-SERIES
TYPICAL GENERAL ARRANGEMENT

PLANT AREA

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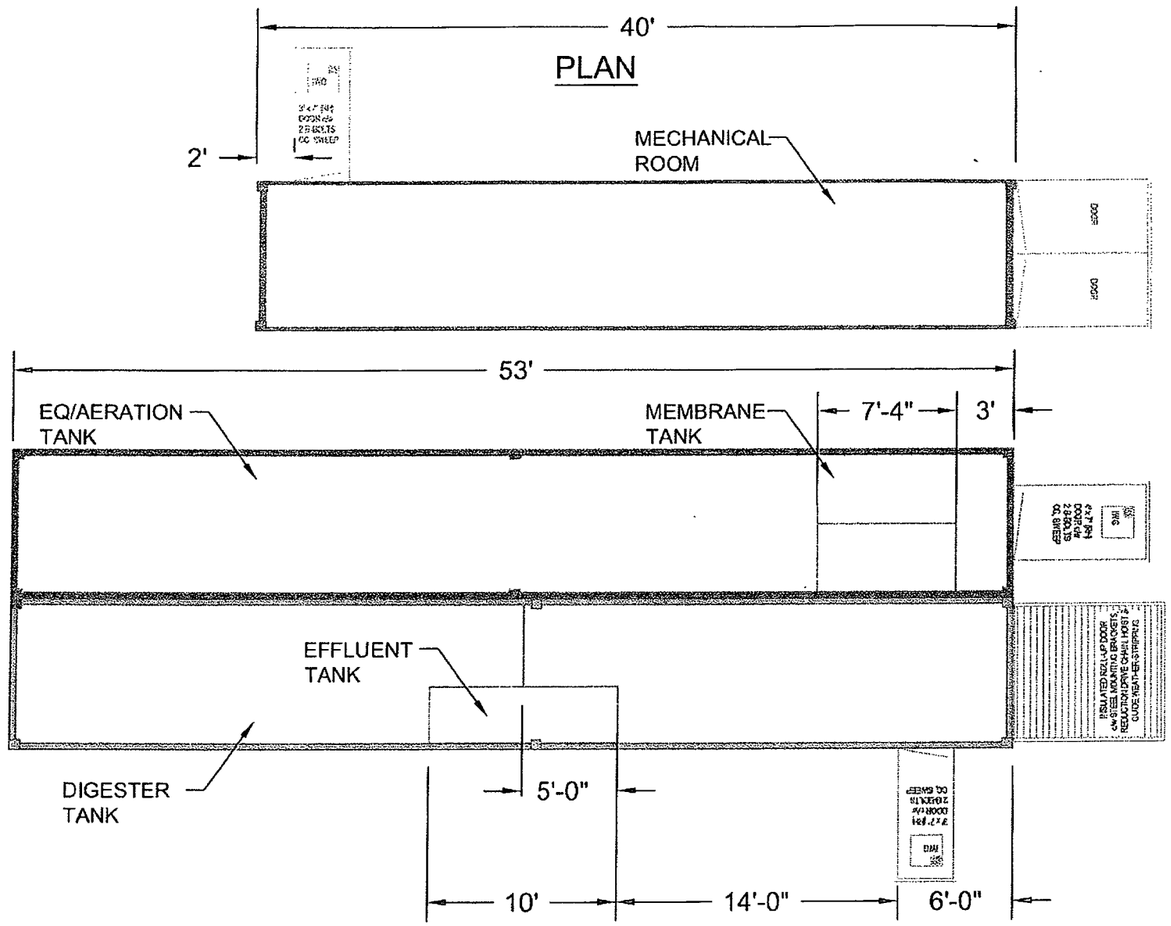
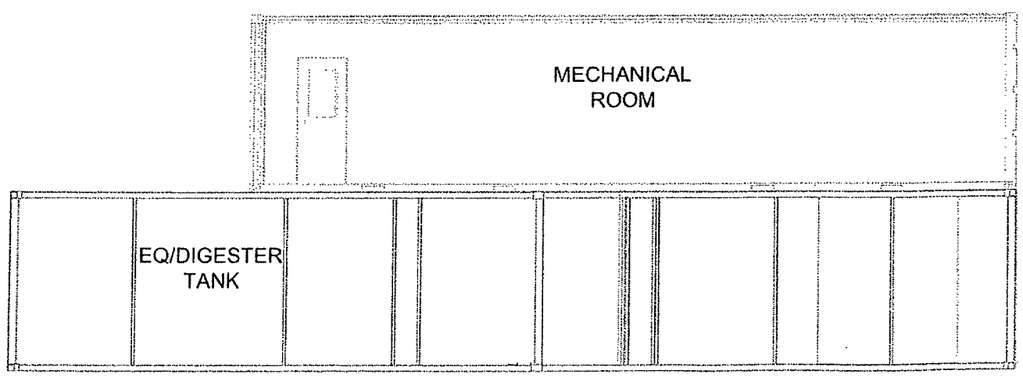
DRAWN BY	CHECKED BY	APPROVED
PSH		
SHEET	DRAWING NO.	REV.
1 OF	011006-LAY-004	0





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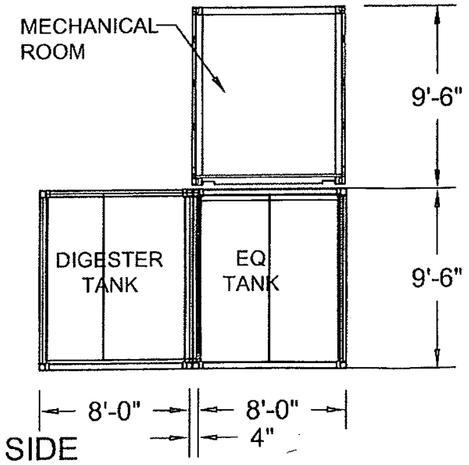

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0	10 07 23	ISSUED FOR INFO				

TITLE

600 PERSON C-SERIES
TYPICAL GENERAL ARRANGEMENT

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SHEET 1 OF	DRAWING NO. 011006-LAY-003	REV. 0

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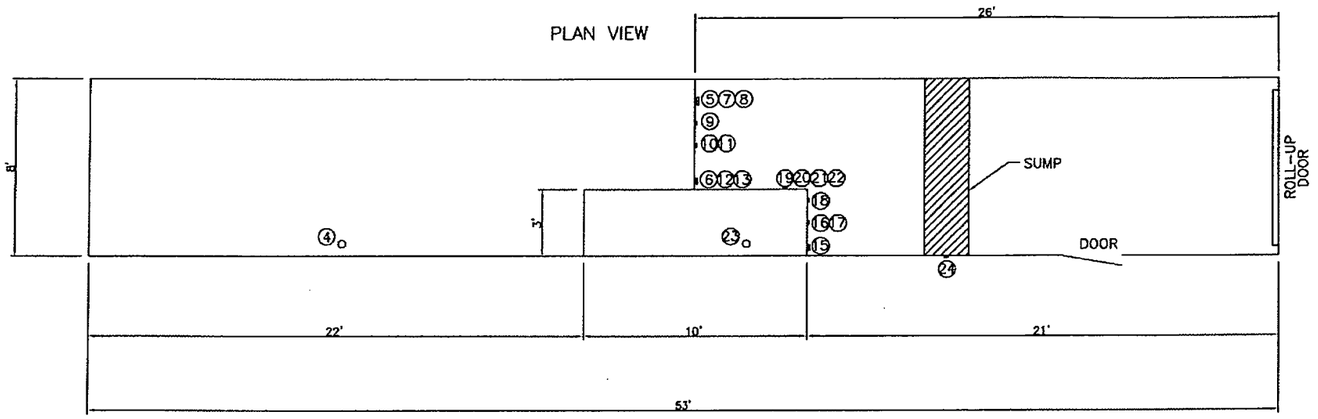

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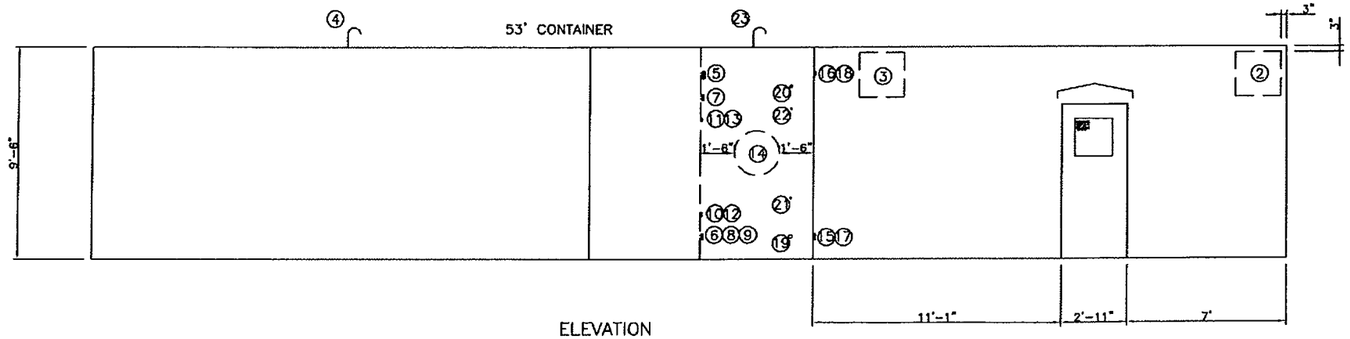
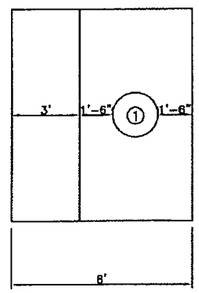


SIDE



DIGESTER CONTAINER NOZZLES VENTS AND MANWAYS

1. 24" MANWAY
2. 24"x24" CUTOUT
3. 24"x24" CUTOUT
4. ?" FLANGE (VENT)
5. 4" MALE CAMLOCK (OVERFLOW)
6. 3" FLANGE (DRAIN)
7. 3" FLANGE (P201 DISCHARGE)
8. 2" FLANGE (P100 SUCTION)
9. 2" FLANGE (BLOWER)
10. 2" FLANGE (LT)
11. 1.5" FNPT (LAHH)
12. 3/4" FNPT
13. 3/4" FNPT
24. 2" MNPT

EFFLUENT TANK NOZZLES VENTS AND MANWAYS

14. 24" MANWAY
15. 3" FLANGE (DRAIN)
16. 2" FLANGE (UV RETURN)
17. 2" FLANGE (P300 SUCTION)
18. 2" FLANGE (GE SKID)
19. 2" FLANGE (LT)
20. 1.5" FNPT (LAHH)
21. 3/4" FNPT
22. 3/4" FNPT
23. ?" FLANGE (VENT)

NOTES

REFERENCE DRAWINGS

REV.	DATE (Y M D)	DESCRIPTION	BY	CHK.	ENG.	APP.
0	10 07 23	ISSUED FOR INFO				

FilterBoxx

TITLE: DIGESTER CONTAINER 600 PERSON C-SERIES TYPICAL GENERAL ARRANGEMENT

PLANT AREA

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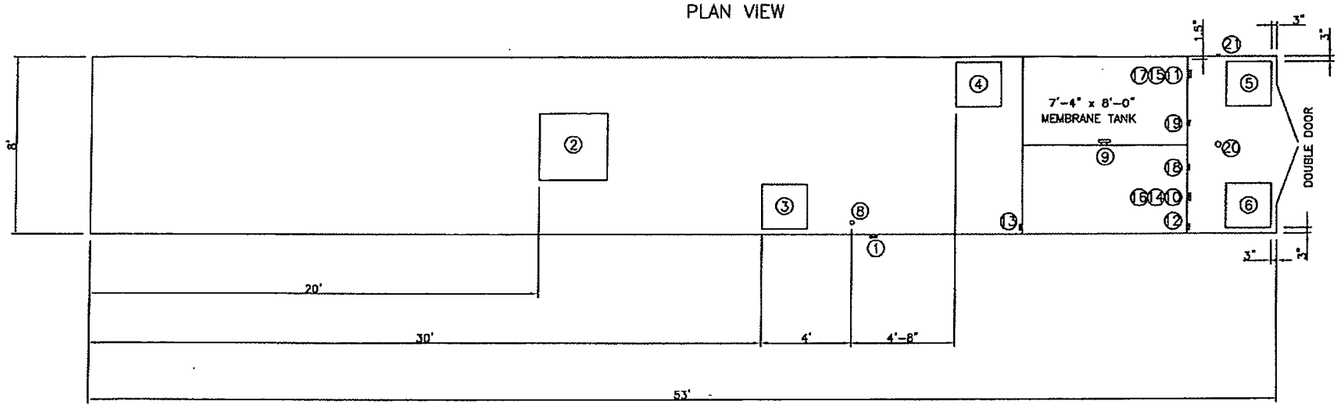
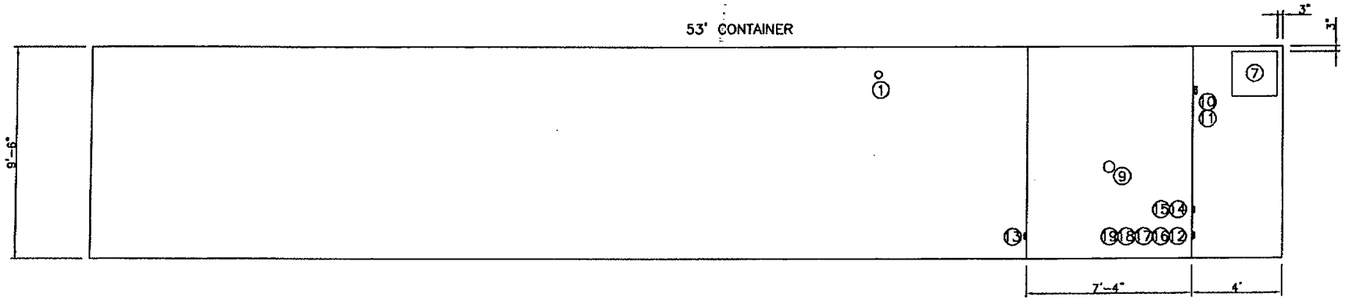
NTS		
DRAWN BY: PSH	CHECKED BY	APPROVED
SHEET: 1 OF	DRAWING NO.: 011006-LAY-002	REV.: 0

PLAN VIEW

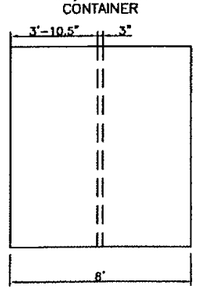


53' CONTAINER



ELEVATION

EQ/AERATION CONTAINER



SIDE

EQ/AERATION
CONTAINER NOZZLES
VENTS AND MANWAYS

1. 4" MALE CAMLOCK
2. 36"x36" MANWAY
3. 24"x24" CUTOUTS
4. 24"x24" CUTOUTS
5. 24"x24" CUTOUTS
6. 24"x24" CUTOUTS
7. 24"x24" CUTOUTS
8. 2" FLOOR DRAIN
20. 2" FLANGE (DRIAIN)
21. 3" FLOOR DRAIN

MEMBRANE
TANKS NOZZLES
VENTS AND MANWAYS

9. 6" FLANGE (CONNECTING TANKS)
10. 4" FLANGE
11. 4" FLANGE
12. 3" FLANGE (PASS THROUGH PIPE)
13. 3" FLANGE (PASS THROUGH PIPE)
14. 3" FLANGE (P200 DISCHARGE)
15. 3" FLANGE (P200 DISCHARGE)
16. 3" FLANGE (P201 SUCTION)
17. 3" FLANGE (P201 SUCTION)
18. 3" FLANGE (DRAIN)
19. 3" FLANGE (DRAIN)

NOTES

REFERENCE DRAWINGS

REV.	DATE (Y M D)	DESCRIPTION	BY	CHK	ENG.	APP.
0	10 07 23	ISSUED FOR INFO				

FilterBoxx

TITLE
EQ/AERATION CONTAINER
600 PERSON C-SERIES
TYPICAL GENERAL ARRANGEMENT

PLANT AREA

SCALE		
NTS		
DRAWN BY	CHECKED BY	APPROVED
PSH		
SHEET	DRAWING NO.	REV.
1 OF	011006-LAY-001	0

Attachment 10

Waste Water Treatment Plant Process Description

3.0 Introduction

This Sewage Treatment Plant (STP) is designed to treat the sewage water from the BlackSand 600m Craft Camp. The facility consists of the following micro systems:

- Influent Prescreening
- Equalization / Aeration Bioreactor
- GE Process Skid
- Ultrafiltration Membranes (UF)
- Treated Water Effluent Disinfection and Distribution
- Sludge Aerobic Digestion and Decant
- Programmable Logic Controller (PLC)
- Human Machine Interface (HMI)
- Motor Control Centre (MCC)

The FilterBoxx Ultrafiltration (UF) STP consists of three buildings assembled together to form the STP. The buildings are equipped with pumps, motors, process control equipment, heating, lighting and monitoring instrumentation which are to be wired directly to the PLC and MCC control panels.

The pre-screened sewage is discharged into the Equalization (EQ)/Aeration Process Tank, TK-3600, where the sewage feed flow will be attenuated. The pre-screen will also be backwashed via sprayer system using the STP's treated water effluent. The majority of the sewage treatment will be performed in the EQ/Aeration Tanks as a suspended growth biological treatment process. The process utilizes aerobic or oxygen using bacteria to remove organic contaminants through a process of biological oxidation.

The air required to meet the oxygen demands of the system and to provide the mixing of the mixed liquor suspended solids (MLSS) is supplied by Aeration Blower, B-8700, and fine bubble diffusers.

The operating level in the EQ/Aeration process tank are monitored by a submerged level transmitter, LT-3626, and a High-High level switch, LSHH-3601. The transmitter and switch control the operation of the membrane trains and warn of potential tank overflow. The EQ tank is also equipped with an overflow line that connects it to the digester.

The sewage is pumped from the EQ/Aeration tanks to the two Ultrafiltration (UF) Membrane Tanks, TK-3400-1/2, via the Membrane Feed Pump, P-3600. The feed to the membrane trains can be controlled via a Flow Control Valve, HCV-3680. The membrane tanks have an overflow back to the EQ/Aeration tank that serves as the Return Activated Sludge or RAS flow.

The two (2) UF Membrane process trains are each designed to handle up to the average daily flow of the plant. They can be operated in either of two modes, Dedicated or Common. The preferred normal operating mode is the Common mode of operation. In this mode the blower and permeate/backpulse lines are connected and the two membrane cassettes work together. The plant will run 0, 1 or 2 permeate pumps depending on the level in the EQ/Aeration tank pulling from both cassettes at the same time. Both backpulse pumps will be in operation when in common mode. The dedicated mode of operation treats each membrane cassette and permeate pump as a separate train. This mode is to be used if a membrane cassette needs to be taken offline for service or cleaning.

Once in the UF membrane tanks the final effluent is processed or filtered through the GE UF Membrane Elements. The UF Membranes are physical barriers designed to filter out suspended solids in the sewage larger than 0.04 µm.

The UF membranes are immersed in the sewage and are referred to as "outside in" filters; therefore the solids that are filtered out of the sewage are retained in the UF Membrane tank and recirculated back to the EQ/Aeration tank via the overflow weir.

The membrane tanks are equipped with low level alarm switches LSLL-3404-1/2. These switches protect the membranes from being exposed to the air. Exposed membranes will dry out and can be permanently damaged.

The final treated effluent drawn through the UF Membranes by the UF Permeate pumps, P-3500-1/2, is discharged into the UF Backwash or Treated Water Effluent tanks via a three-way motorized control valve, FV-3560. Permeate is used to periodically Backwash the UF membrane system by means of the Backwash pumps, P-8800-A/B, and a pair of three-way motorized control valves, FV-3561-1/2. The UF membrane Backwash sequence is performed automatically by the PLC.
The system is equipped with two Membrane Blowers, B-8500-1/2, to provide air scour for the membranes.

The UF Membranes will undergo a scheduled Maintenance Clean with Sodium Hypochlorite or Citric Acid which is dosed directly into the UF Membrane tanks. These chemicals are used to remove the build-up of organic and inorganic foulants on the surface of the UF membranes. This cleaning sequence is performed automatically by the system PLC according to the maintenance cleaning schedule. Maintenance cleans should be scheduled daily at a time of low flow to the system.

The UF Permeate or final effluent is pumped from the Treated Water Tank via the Treated Water Effluent Pump, P-1800, to the four (4) parallel Ultraviolet (UV) disinfection system units. As the final effluent passes around the quartz UV light tubes, the bacteria or viruses that were not filtered by the UF Membrane system will be rendered "inactive" or dead prior to discharge. The effluent pump runs continuously, the level in the effluent tank is controlled by the effluent control valve FV-1860. When this valve is open the effluent is sent out of the system for discharge in the effluent field. When this valve is closed the effluent recirculates through the UV's and PRV-1879 back to the effluent tank.

To prevent the accumulation of solids and to control sludge age within the biological system, the Waste Activate Sludge pump, P-3400 is used to send solids from the bottom of the membrane tanks to the Sludge tank, TK-7200. The pump operates on a frequency and duration control.

Periodically, supernate can be decanted from the Sludge via the Decant Pump, P-7200 and directed to the EQ/Aeration Tanks. The digested solids are to be periodically hauled off site.

The STP is to be operated under automatic controls by the Programmable Logic Controller or PLC unit during normal operating conditions. All screening, aeration and pump systems are monitored and controlled by the PLC unit and operation may be monitored via the Motor Control Centre or MCC. Equipment should not be operated in MANUAL/HAND mode unless under direct operator attention for equipment test purposes or due to instrumentation failure **(i.e. Alarms/Alerts do not affect MANUAL/HAND control)**. AUTO operation is where the system PLC is in full control of the system devices **(i.e. all Alarms/Alerts will control devices)**.

3.1 System Equipment List

- **Main Control Panel**

- Programmable Logic Controller (PLC)
- Human-Machine Interface (HMI) Operator Interface Screen
- All electrical equipment/devices within system provided by FilterBoxx

- **Sewage Water Influent and Pre-Screening System**
  - Sampling Points
  - Level and Flow monitoring Instrumentation
  - Pre-Screening and Handling
  - Influent Composite Sampler

- **Equalization and Aeration Process Tank and Inlet Screen**
  - Coated Carbon Steel EQ/Aeration Tank
  - Tank Aeration System
  - Membrane Feed Pump
  - WAS Pump
  - Raw Water Screen
  - Sampling Points
  - Level, Flow and Pressure Control Instrumentation and Monitoring Equipment

- **Ultrafiltration (UF) Membrane System**
  - 2 x 100% Process Equipment Supply
  - Skid mounted package
  - 2 x 6module 500A GE Zenon Ultrafiltration membrane cassettes
  - UF Membrane Support Structures
  - Pumps/Aeration Blowers
    - Permeate Pumps
    - Backpulse Pumps
    - Aeration Blowers
    - Chemical Dosing
      - Sodium Hypochlorite pump
      - Citric Acid pump
  - Polyethylene Backpulse Tank
  - Sampling Points
  - Level, Flow and Pressure Control Instrumentation and Monitoring Equipment

- **Aerobic Digester and Sludge Handling System**
  - Coated Carbon Steel Sludge Holding Tank
  - Pumps/Aeration Blowers
    - Decant Pump
    - Aeration Blower
  - Sampling Points
  - Level, Flow and Pressure Control Instrumentation and Monitoring Equipment

- **Treated Water Effluent Storage and Discharge System**
  - Coated Carbon Steel Effluent Tank
  - Pumps
    - Treated Water Effluent Pump
    - Level, Flow and Pressure Control Instrumentation and Monitoring Equipment

- **Treated Water Effluent Disinfection System**
  - 4 x Ultraviolet (UV) Disinfection System
    - Level, Flow and Pressure Control Instrumentation and Monitoring Equipment